



A Review of Residential Customer Disconnection Influences & Trends

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Gas & Electric Residential Disconnections

The Commission has been reviewing residential disconnection policies and procedures. As part of this review, the Commission's Policy & Planning Division (PPD) has collected historical data on disconnections spanning the years from 2007 through 2017. There are over 17 million customer accounts spread through the 4 large California utilities. PPD has now monthly billing and disconnection information for these accounts to conduct analysis that could delve deeper in areas such as disconnection, consumption, and overall affordability.

For this report our goal has been to quantify the disconnection rate and identify key factors that influence the changes to that rate. The two primary sources of data that were used in this memo are 1) quarterly compliance reports that IOUs submit to the California Public Utilities Commission (CPUC) pursuant to [D-10-07-048](#), and 2) quarterly ZIP code level disconnection data submitted by the IOUs to PPD as part of a regular PPD data request. In addition to the IOU data, PPD has also collected contemporaneous data on income, unemployment and other economic statistics.

Key observations and findings

- IOU and CPUC policies, practices, and decisions have the biggest influence on the disconnection rate (Fig. 3)
- The unemployment rate in the absence of policy shifts is a very strong independent predictor of the disconnection rate (Fig. 5)
- Income also has predictive value but is only moderately correlated with disconnections (Fig. 2)
- The statewide monthly disconnection rate for NON-CARE customers has fluctuated by a factor of 2 from a high of 0.4% in 2009, to a low of 0.2% in 2011, back to a high of 0.4% in 2016.¹ That amounts to about 48,000 customer accounts disconnected each month on average in 2009, 23,000/month in 2011, and 50,000/month in 2016. (Fig. 1)
- The statewide monthly disconnection rate for CARE customers has fluctuated to a lesser degree than the NON-CARE customers, from a high of 0.6% in 2009, to a low of 0.45% in 2011, back to a high of 0.5% in 2016. That amounts to about 25,000 customer accounts disconnected each month on average in 2009, 22,000/month in 2011, and 22,000/month in 2016. (Fig.1).
- Based on IOU response over 85% of disconnections gets reconnected within the first 48 hours.

Discussion

At this time the CPUC does not have metrics to evaluate the potential impact of decisions or policy shifts on the disconnection rate. Likewise, there are no metrics in place that can evaluate the performance of IOUs in implementing disconnection policy. The ability to bench-mark the disconnection rate to external economic factors could be an effective tool for the CPUC. This could give decision makers the ability to estimate the impact of decisions on the disconnection rate. It could also be used to develop strategy for dealing with economic shocks, recessions and other foreseeable but uncertain events. Additionally, a disconnection model could be used to develop metrics for evaluating the performance of IOUs in implementing cost-effective disconnection practices.

¹ Disconnection rates are based on California's 4 largest IOUs - Pacific Gas and Electric (PG&E), Southern California Edison (SCE), San Diego Gas and Electric (SDG&E), Southern California Gas (SoCalGas)



Recommendations

- Create a working group to evaluate how a disconnection evaluation tool could be used, developed and implemented by the CPUC.

Compliance level data -Trends in the disconnection rate - 2007 -2016

The charts in this section were compiled from the quarterly reports that IOUs submit to the CPUC to be in compliance with D-10-07-048. The charts below show the number disconnections per month for each utility from 2007 through 2017. The solid trend line shows the average monthly disconnections. The box at each yearly interval shows the range of the disconnection rates over the course the year. There is a sharp rise in disconnections for all utilities that corresponds to the beginning of the great recession around 2008. The dip in disconnections is the result of an intervention by the CPUC when the IOUs and ORA entered into a settlement agreement to pause disconnections. Since 2011 the number of disconnections has steadily increased from this paused state. NON-CARE customer disconnections have come back to the level they were at in 2009, while CARE customer disconnections have remained mostly flat. The notable exception is SoCalGas whose number of disconnections has remained at the 2010 level.

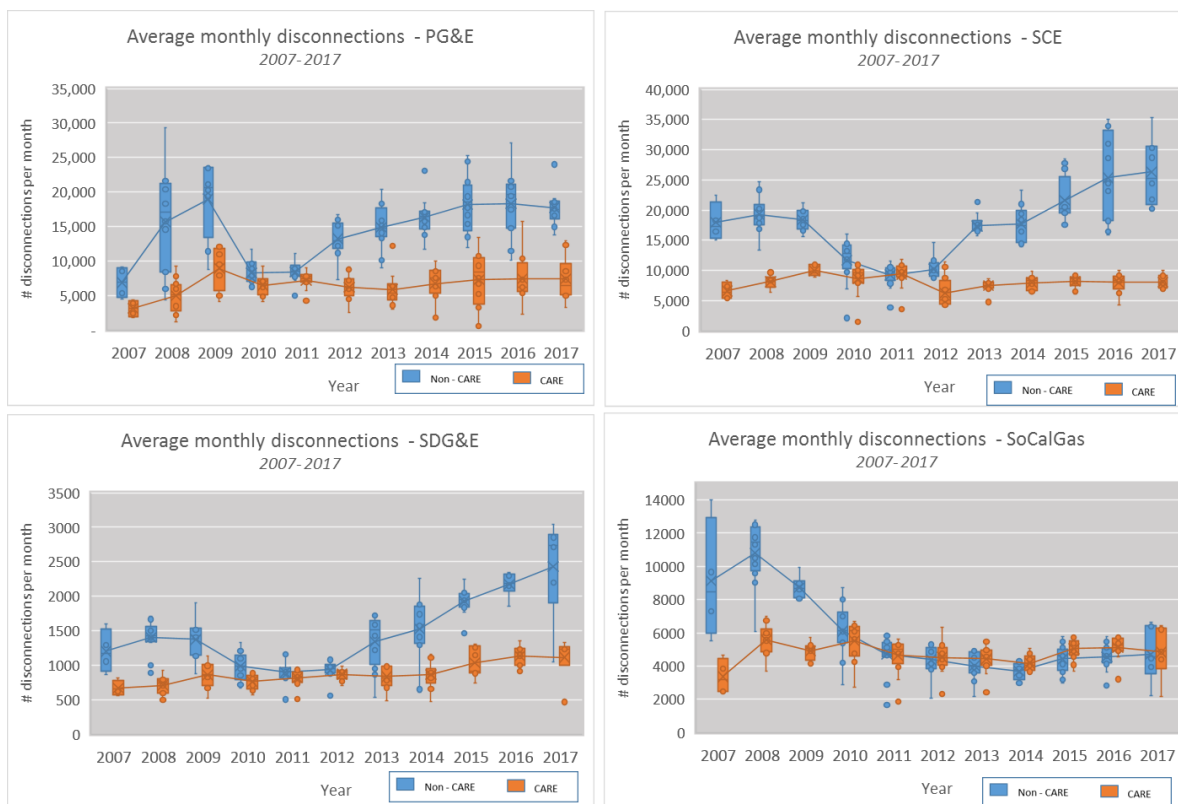


Figure 1. Average monthly disconnections for PG&E, SCE, SDG&E and SoCal Gas. Compiled from quarterly reports required by D10-07-048

✓ Key-takeaway –

- The disconnection rate dropped by a factor of two as a result of the 2010 decision. Since that time the rate has come back up to 2009 levels (with the notable exception of SoCal Gas).



- In 2015 there is also a noted increase in the month to month volatility of the disconnection rate compared to 2011.

Zip code level disconnection data

The charts in this section were compiled from the zip-code level data provided to PPD by the IOUs. The zip-code level disconnection data runs from approximately 2008 through 2017 and includes the number of CARE and NON-CARE disconnections in each of the zip-code within the IOUs service territory for each month of the year.

We also compiled data from the IRS Statistics of Income (SOI) database². That database has a detailed summary of IRS returns at the zip-code level and includes statistics on income, unemployment insurance income, number of dependents, social security income, mortgage deduction, renewable energy deductions, etc. In this memo we make use of Adjusted Gross Income (AGI) and % of returns that include unemployment insurance income.³ We use this metric as an estimate of the zip-code level unemployment rate for each year. We should note that this IRS calculated unemployment rate differs from the more widely quoted Bureau of Labor Statistics (BLS) unemployment rate. The BLS rate is derived from a sample of people in each month of the year, while the IRS data is derived from returns of all individuals who filled for insurance at any time during a year. Thus the IRS data has higher geographic resolution but lower temporal resolution and BLS data has lower geographic resolution and higher temporal resolution.

Influences on disconnections: Income

Figure 2 shows the relationship between household income and disconnections. In this chart, we have aggregated zip-codes with a similar income into bins (0 – 30K, 30k – 40k, etc.). All of the disconnections from these zip-codes have been summed together to calculate the overall disconnection rate for the income group. We should make clear that this is not the income for individuals but is the average income for an entire zip-code. As such this represents an economic measure of a small region. (I.e. a wealthy neighborhood vs. a moderate-income neighborhood vs. a low-income neighborhood)

Figure 2 illustrates that the relationship between income and disconnections is non-linear. The disconnection rate is flat for all income regions above about \$90k, i.e. having more income does not seem to impact the number of people that will be disconnected. However, below 90k there is a clear negative correlation between income and the disconnection rate.

² See <https://www.irs.gov/statistics/soi-tax-stats-individual-income-tax-statistics-zip-code-data-soi>

³ In the remainder of this paper we will refer to the AGI simply as “income” and % of returns with unemployment claims as the unemployment rate

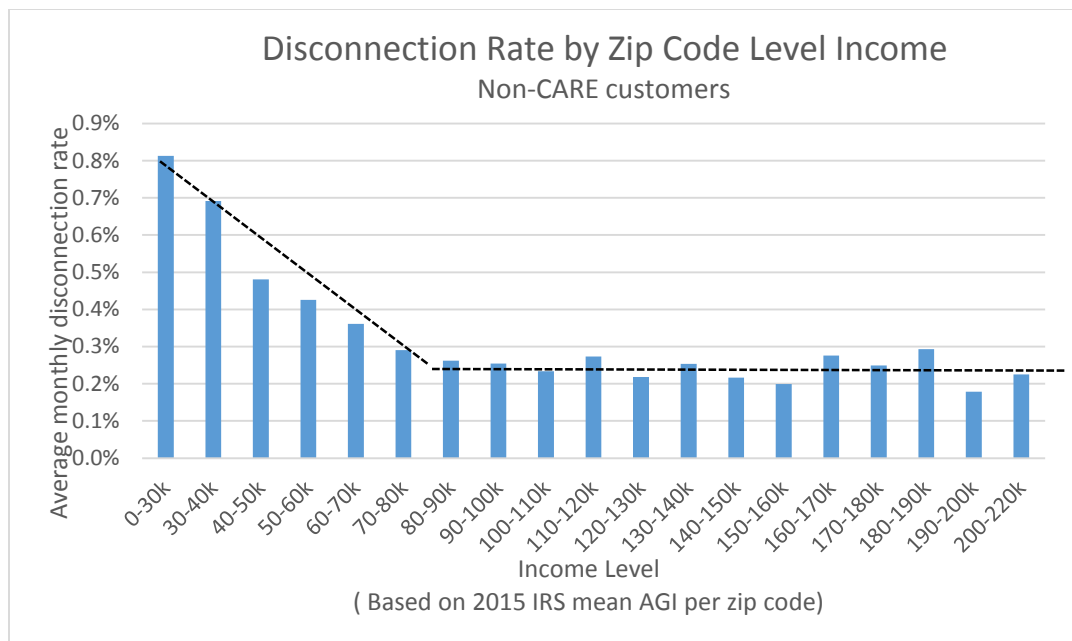


Figure 2 Disconnection rate by income (All IOUs)

- ✓ **Key-takeaway** - The correlation between disconnection rate and income is only moderate due to the nonlinear nature of the relationship.

Influences on disconnections: Unemployment

Intuitively we expect that the unemployment rate would be a key driver of disconnections. Figure 3 plots the annualized monthly disconnection rate for PG&E along with the annual BLS unemployment rate for 2007 - 2016 on the same chart. Prior to 2010, as expected, the disconnection rate and unemployment rate seemed to be positively correlated, both moving upward together. After the 2010 pause, however, the unemployment and disconnections correlations flip and become negatively correlated. By 2015 the disconnection rate had risen to the pre-pause rate of 2009 while the unemployment rate had dropped down to 6%.

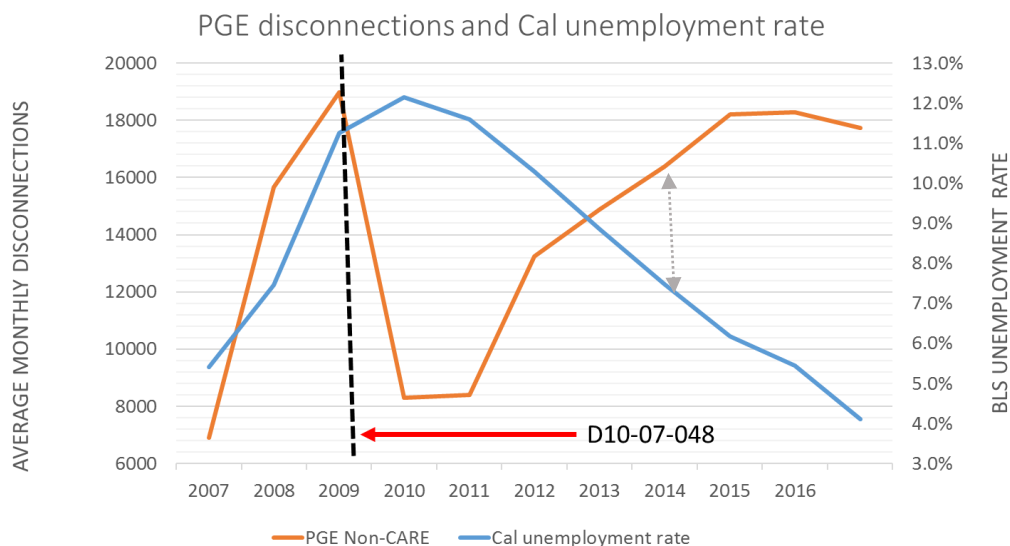


Figure 3. Disconnections and unemployment trend

The reversal of the trend can be seen as a shock to a system and then a response to recover to a natural state over time. Without the pause, it seems likely that disconnections would have continued to rise to 20-22K/month around 2011, and then would have started to decline thereafter. If we could demonstrate that unemployment is a driver of disconnections, then we would be able to extrapolate the disconnection rate using the observed unemployment rate. With the extrapolated disconnection rate we could then estimate the number of avoided disconnections. Figure 4 illustrates how an avoided disconnection calculation could be made when the disconnection rate is derived from an external factor – like unemployment. In this case there are not only disconnections initially avoided, but also excess disconnections that occur as the system gyrates back and forth in recovery.

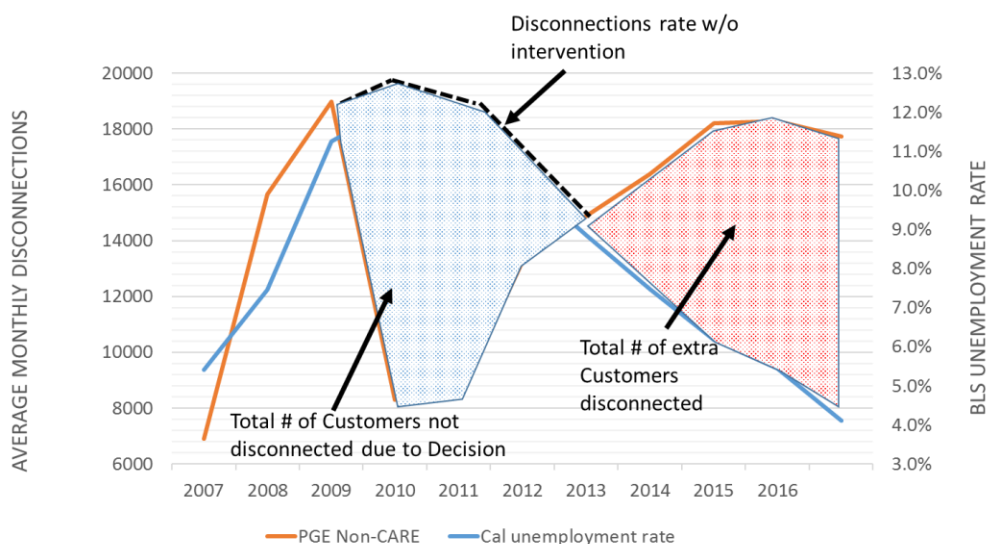


Figure 4 Avoided Cost of disconnections



Unfortunately, the development of a full scale model is beyond the scope of this memo. Nevertheless, in order to assess unemployment as a potential predictor of disconnections, we have constructed two simple models using 2012 and 2015 data. In these models we calculated the unemployment rate for each of the 19 income bins as defined above. We then plotted the unemployment of each income bin vs the disconnection rate. Using both of these factors together yields a very strong correlation between unemployment and disconnection rate ($R^2 \geq 0.9$). The plot on the left shows unemployment to disconnections ratio in 2012. This model estimates that a 1% change in unemployment yields a 0.043% change in the disconnection rate. The model on the right, however, estimates that in 2015 a 1% change in unemployment yields a .11% change.

The larger coefficient of the 2015 model indicates that the range of disconnection rates from zip code to zip code should be expected to increase. In particular, if a region experiences high unemployment this model indicates that it will experience much higher than average disconnection rates as compared to 2012. This volatility is can be seen in figure 1 where the 2015 box heights are significantly larger than the 2012 box heights.



Figure 5 Unemployment rate vs disconnection rate 2012 and 2015

While the model for a single year is strong, the multi-year model is weak. Nevertheless, unemployment can still be a very valuable metric to quantify the performance of the utility practices. For example, 2015 the unemployment model might imply that regional differences are a key driver of disconnections.

✓ **Key-takeaway –**

- Unemployment in the absence of policy shifts is a very strong predictor of disconnections
- Based on the negative correlation with the unemployment rate it appears, that the disconnection rate still seems to be recovering from the shock of 2010
- If the trend from 2012 to 2015 continues, an increase in disconnection disparity between high unemployment communities and low unemployment communities may occur.
- Unemployment rate models could be developed to prospectively evaluate the impact of future decisions on the disconnection rate



Influences on disconnections: Geography

Regional factors appear to be another factor that determines the disconnection rate. Figure 5 shows the monthly average disconnection rate in 2015 for all counties served by the four major IOUs. The rates range from a high of almost 1% down to a low of 0.1% - a factor of ten differences! Even if we eliminate the extreme values there is still a factor of three differences between the 10th percentile and 90th percentile counties.

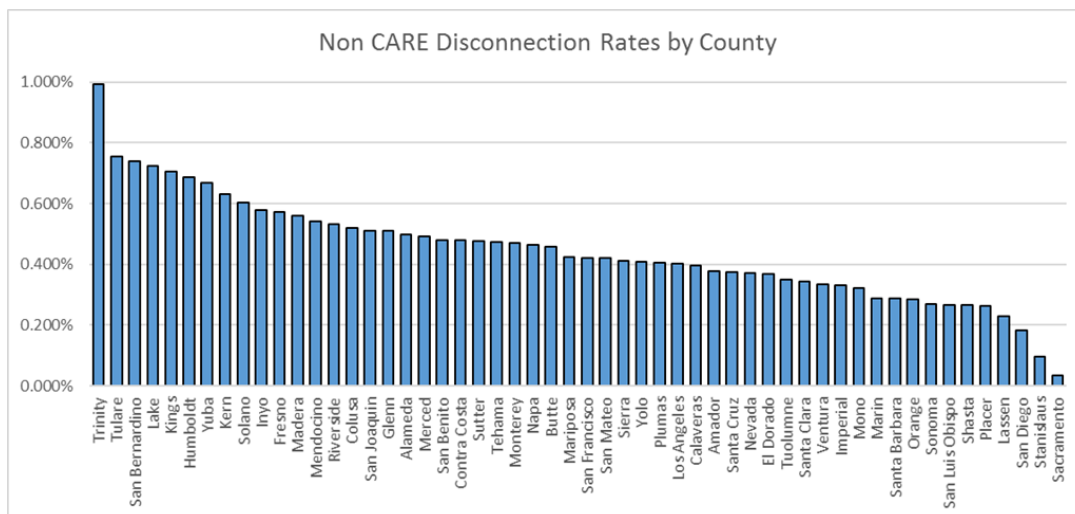


Figure 6 Disconnection rate by County 2016

We assumed that income and /or unemployment might be important factors in the county to county differences. Figure 6 shows plots for income and unemployment rates vs disconnections for each county. There is virtually no correlation apparent at all from these plots. At this time, we do not have a reasonable explanation for what is driving the county to county differences.

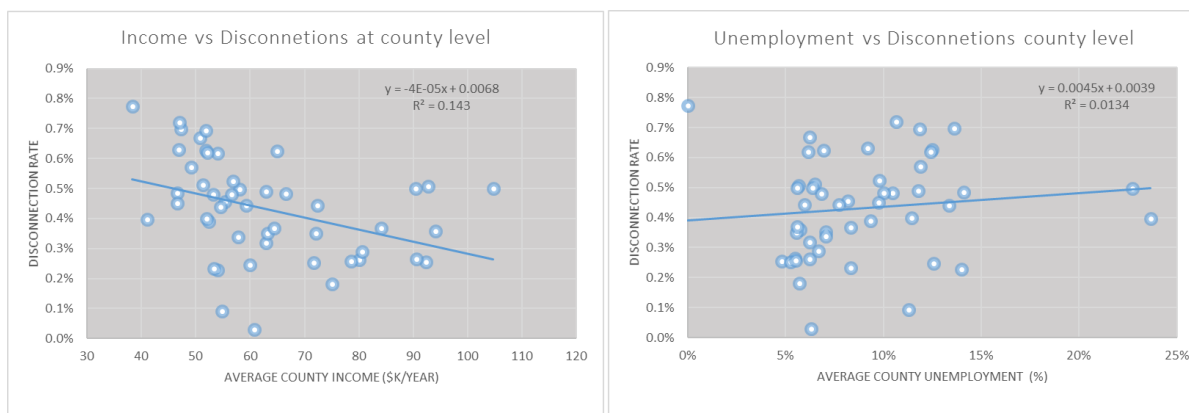


Figure 7 County level economic factors

✓ Key-takeaway –

- There appears to be a significant regional component behind the disconnection rate but at this time it is not clear what that might be.
- Some possible regional factors to explore include
 - Climate e.g. differences in the cooling and heating degree days



- Adoption rate of energy efficient technologies and services and buildings
- Differences in employment volatility, i.e. part-time and seasonal workers impact
- Social and cultural differences.

Conclusions:

One of the less well known consequences of the great recession was the increase in the number of customers that were disconnected from utility service. In response to this issue the CPUC adopted a decision that amended the rules that govern the disconnection process. While this response initially had the intended effect of reducing the number of disconnections, there has been a long recovery from this shock and many questions remain about what should be done to manage the disconnection process going forward.

In this paper we document the historical trends in disconnections and relate some external economic factors to the disconnection rate. We also discuss methods to evaluate the effectiveness of policies practices and decisions.

But we have not discussed policy options. This paper does not attempt to define what the “natural state” of disconnections should be. Rather we discuss methods that could be developed to monitor and measure where the state of disconnections is and where it might be going. It is the hope that the development of these tools can assist decision-makers in making those policy decisions about where the “nature of disconnections” should be.



Appendix: Disconnection Maps for California

Below are maps of the NON-CARE disconnection rates for each of the 4 major IOUs. The color scale is based on deciles. “0- 10” are zip codes with a disconnection rate in the first 10th percentile, “90 – 100” are zip codes with the highest rate and are above the 90th percentile.

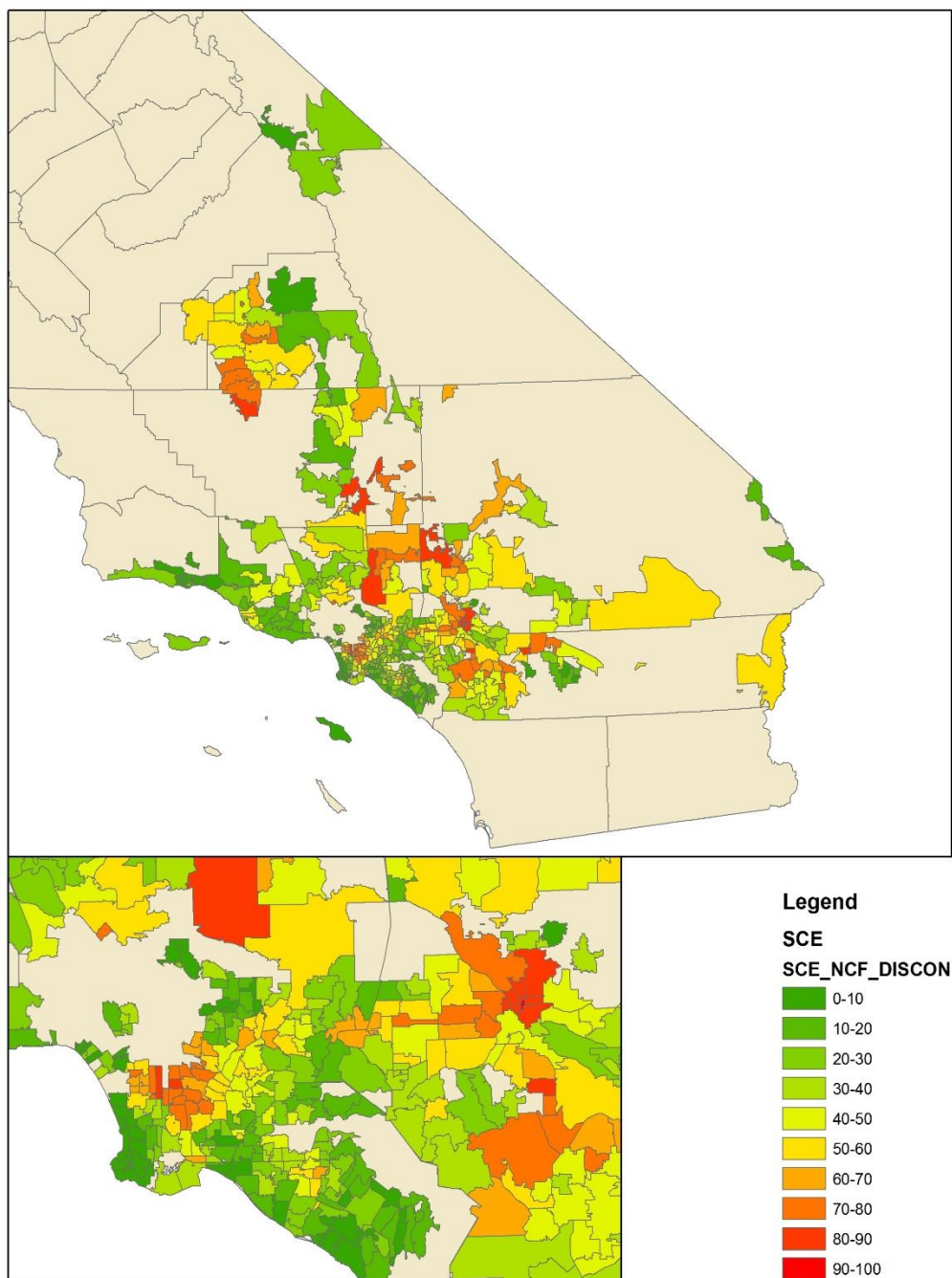


Figure 8 Map of SCE 2016 NON-CARE Disconnections

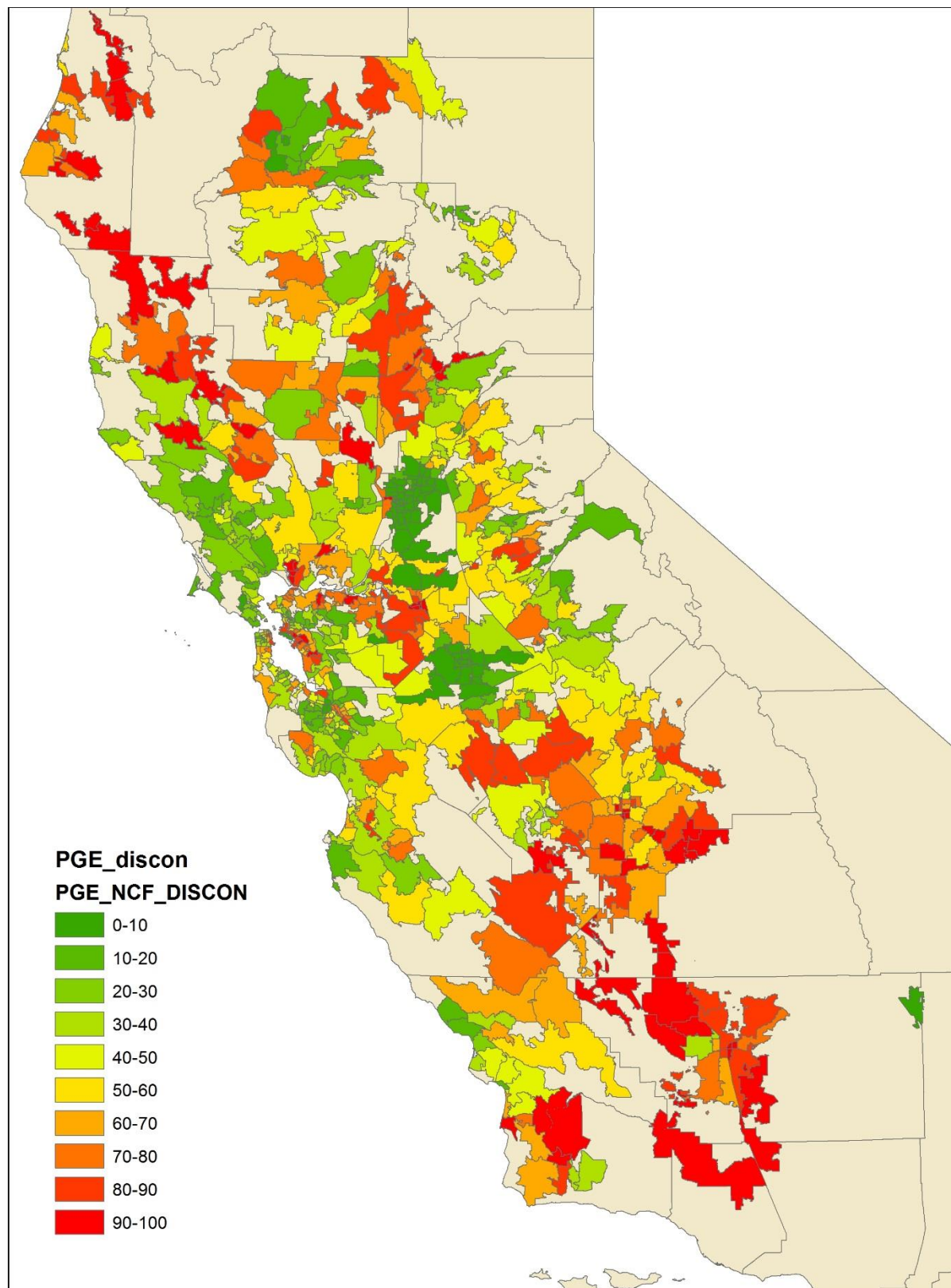


Figure 9 PGE NON-CARE Disconnections 2016

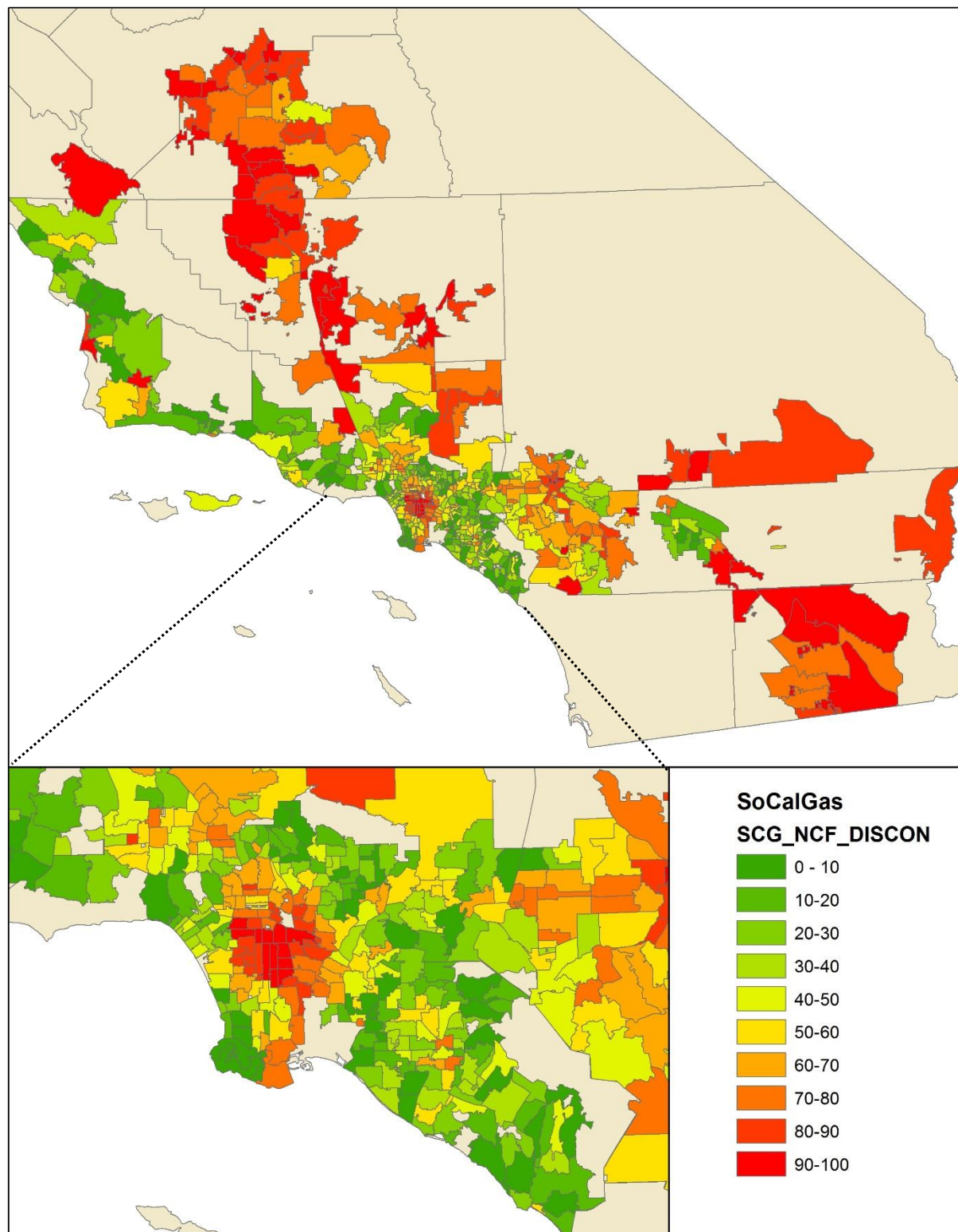


Figure 10 SoCalGas Non CARE Disconnections 2016

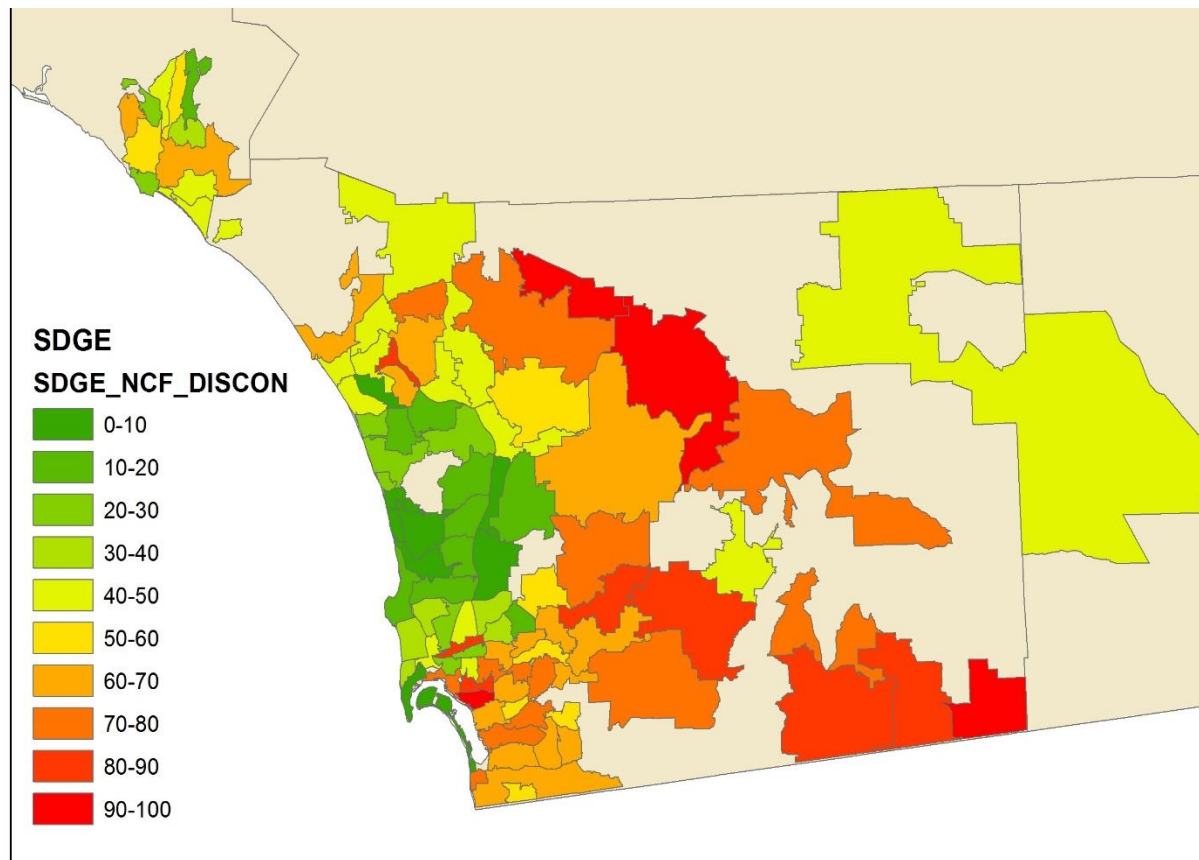


Figure 11 SDGE NON CARE Disconnections 2016